

Memo

To: Blake Johnson and Mitra Emami, HDR
From: Zia Zafir - Sacramento
Date: March 7, 2007
Project No.: 66388/8
Subject: **Revised Design Memorandum
TRLIA Certification
Statistical Analyses on QA Data**

This revised memorandum incorporates comments by USACE dated March 5, 2007 and transmits results of statistical analysis on the QA tests data performed by Kleinfelder on Phases 2 and 4 of the TRLIA project. The QA tests were performed in 2005 and 2006.

Sand Fill (Yuba Seepage Berm)

Sand fill statistical data are summarized for Percent Fines and Field Relative Density in the form of minimum, maximum, mean, and standard deviation in the Tables 1 and 2 below. Distribution of the data is presented in Figures 1 and 2.

Table 1 – Percent Fines QA Data Summary for Phase 2 Sand Fill

% Fines – PHASE 2 SAND FILL	
Value	QA
Number of Samples	57
Minimum	1.8
Maximum	7.8
Mean	5.1
Standard Deviation	1.3
No. Failing Tests	25

Table 2 – Field Relative Density Data QA Data Summary for Phase 2 Sand Fill

Field Relative Density – PHASE 2 SAND FILL	
Value	QA
Number of Samples	74
Minimum	31.1
Maximum	155.6
Mean	91.0
Standard Deviation	23.8
No. Failing Tests	5

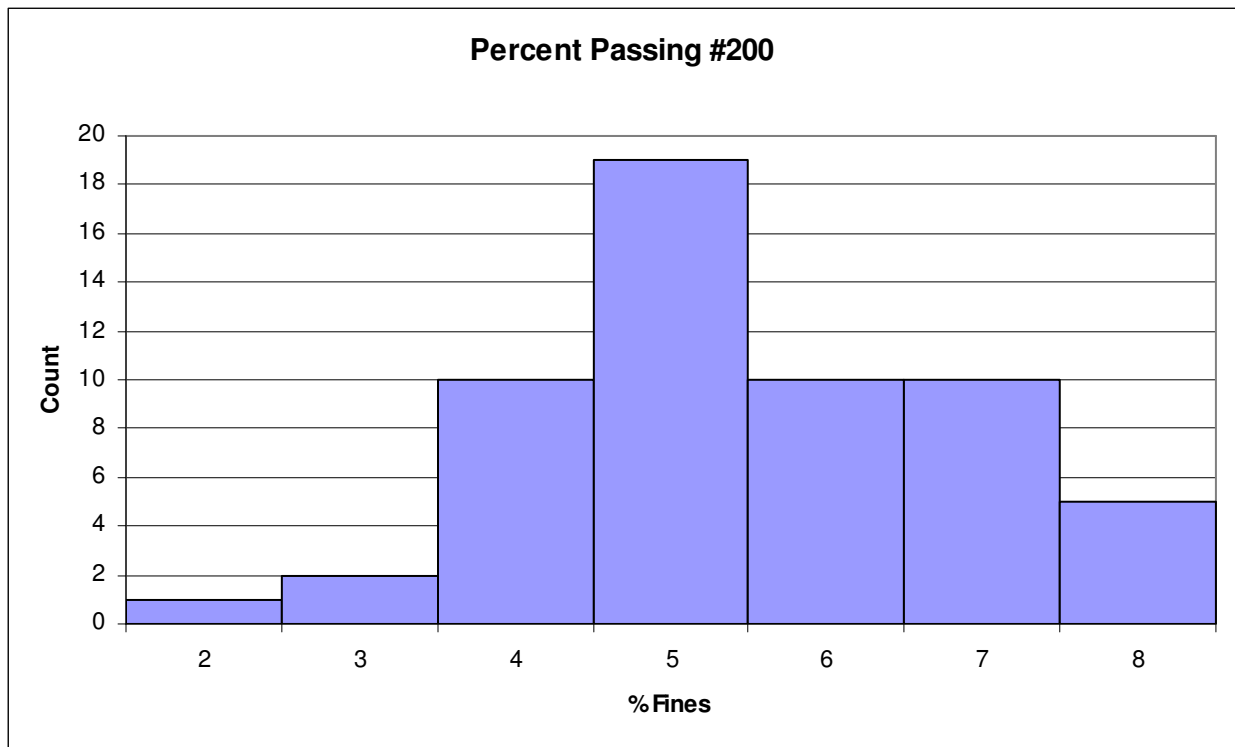


Figure 1: Histogram for Phase 2 Sand Fill – Percent Fines

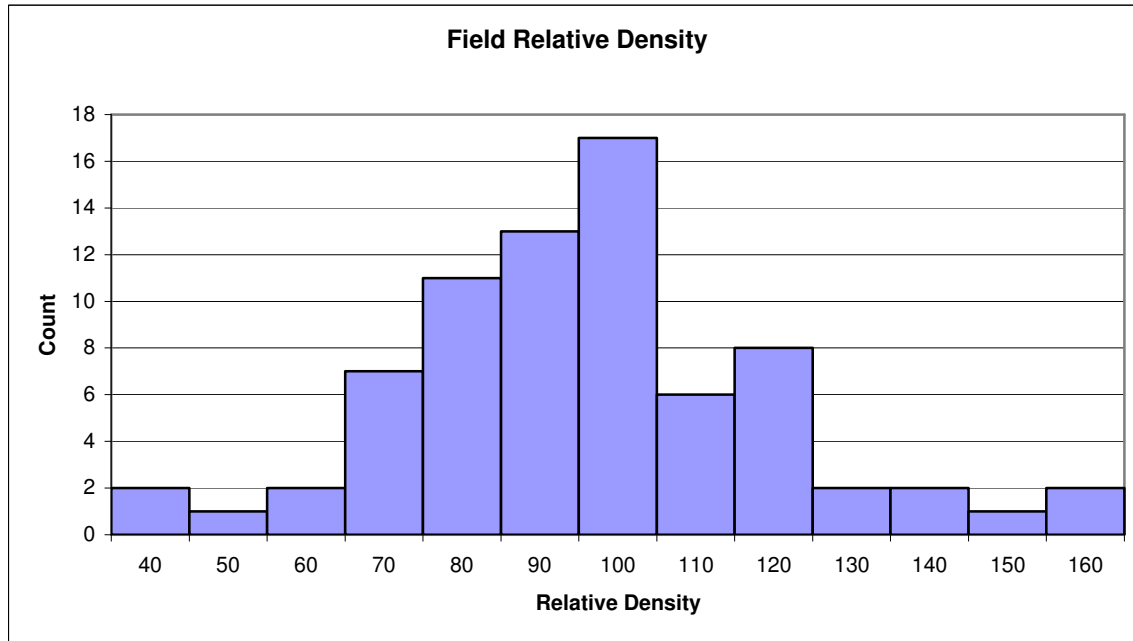


Figure 2: Histogram for Phase 2 Sand Fill – Field Relative Density

Phase 2 WPIC Embankment Fill

WPIC Embankment Fill statistical data are summarized for Percent Fines, Liquid Limit, Plasticity Index, and Relative Density in the form of minimum, maximum, mean, and standard deviation in the Tables 3 through 6 below. Distribution of the data is presented in Figures 3 through 6.

Table 3 – Percent Fines QA Data Summary for Phase 2 WPIC Embankment Fill

% Fines – PHASE 2 WPIC EMBANKMENT FILL	
Value	QA
Number of Samples	112
Minimum	12
Maximum	94.2
Mean	68.8
Standard Deviation	13.5
No. Failing Tests	3

Table 4 – Liquid Limit QA Data Summary for Phase 2 WPIC Embankment Fill

LL – PHASE 2 WPIC EMBANKMENT FILL	
Value	QA
Number of Samples	115
Minimum	0
Maximum	62
Mean	35.8
Standard Deviation	8.5
No. Failing Tests	5

Table 5 – Plasticity Index QA Data Summary for Phase 2 WPIC Embankment Fill

PI – PHASE 2 WPIC EMBANKMENT FILL	
Value	QA
Number of Samples	115
Minimum	0
Maximum	47
Mean	18.0
Standard Deviation	6.5
No. Failing Tests	13

Table 6 – Relative Compaction QA Data Summary for Phase 2 WPIC Embankment Fill

Relative Compaction – PHASE 2 WPIC EMBANKMENT FILL	
Value	QA
Number of Samples	31
Minimum	87
Maximum	98
Mean	93.5
Standard Deviation	3.1
No. Failing Tests	1

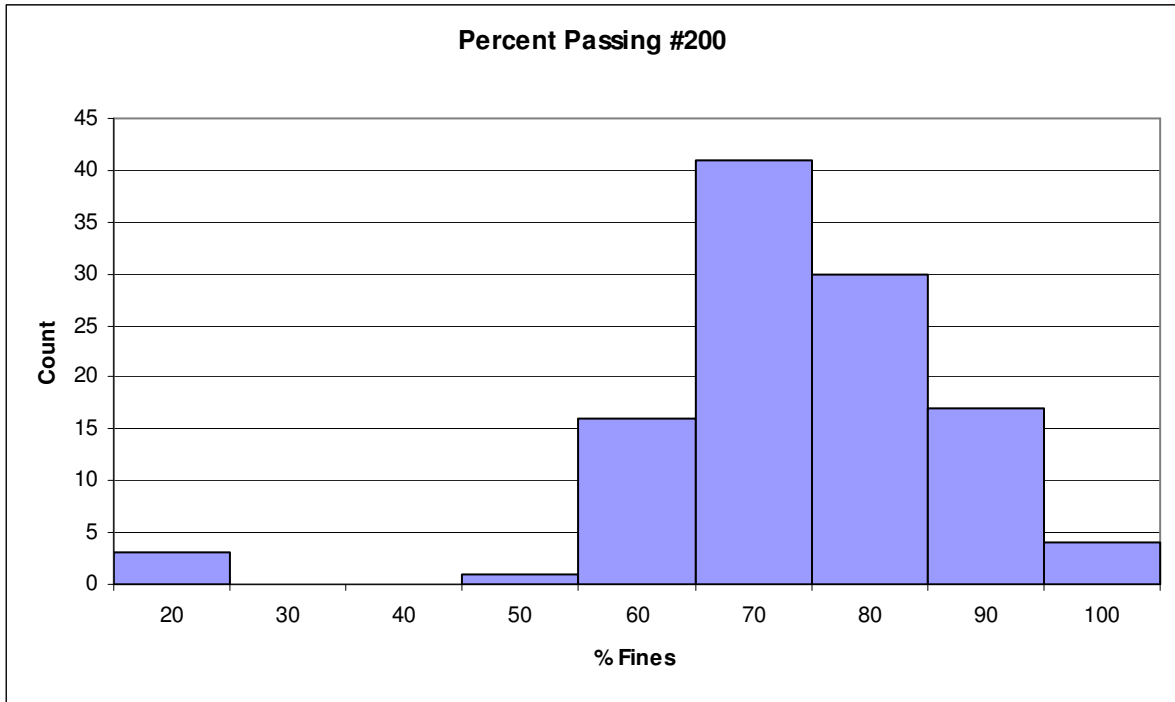


Figure 3: Histogram for Phase 2 WPIC Embankment Fill – Percent Fines

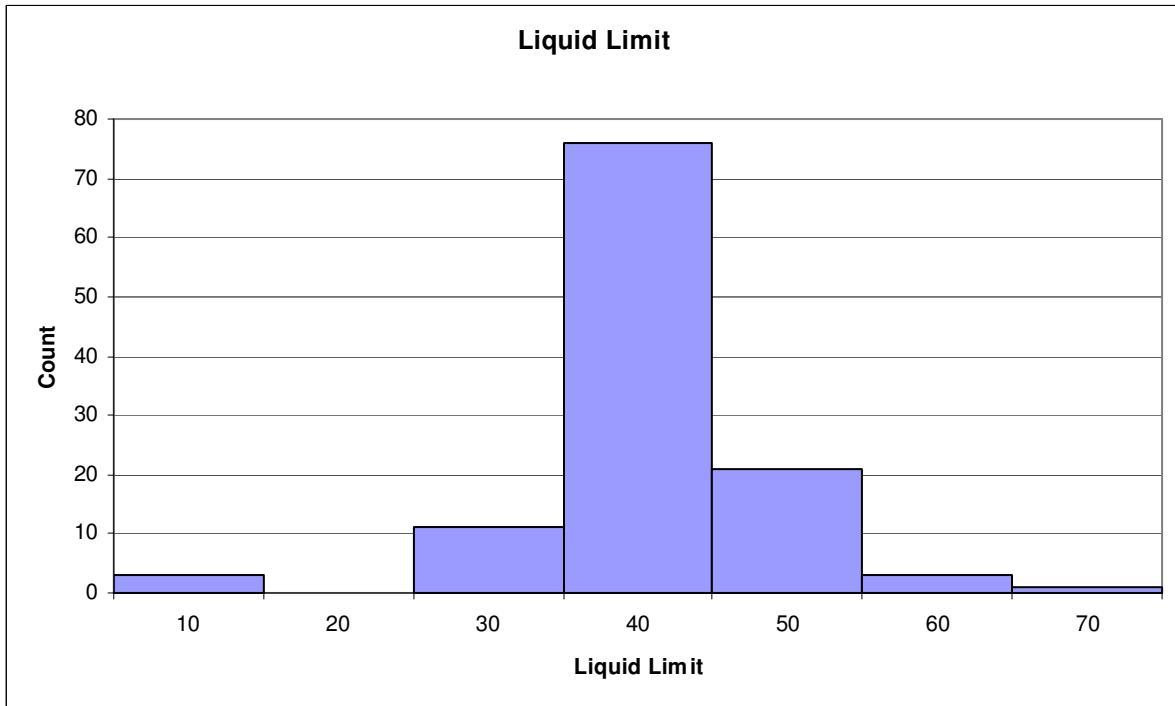


Figure 4: Histogram for Phase 2 WPIC Embankment Fill – Liquid Limit

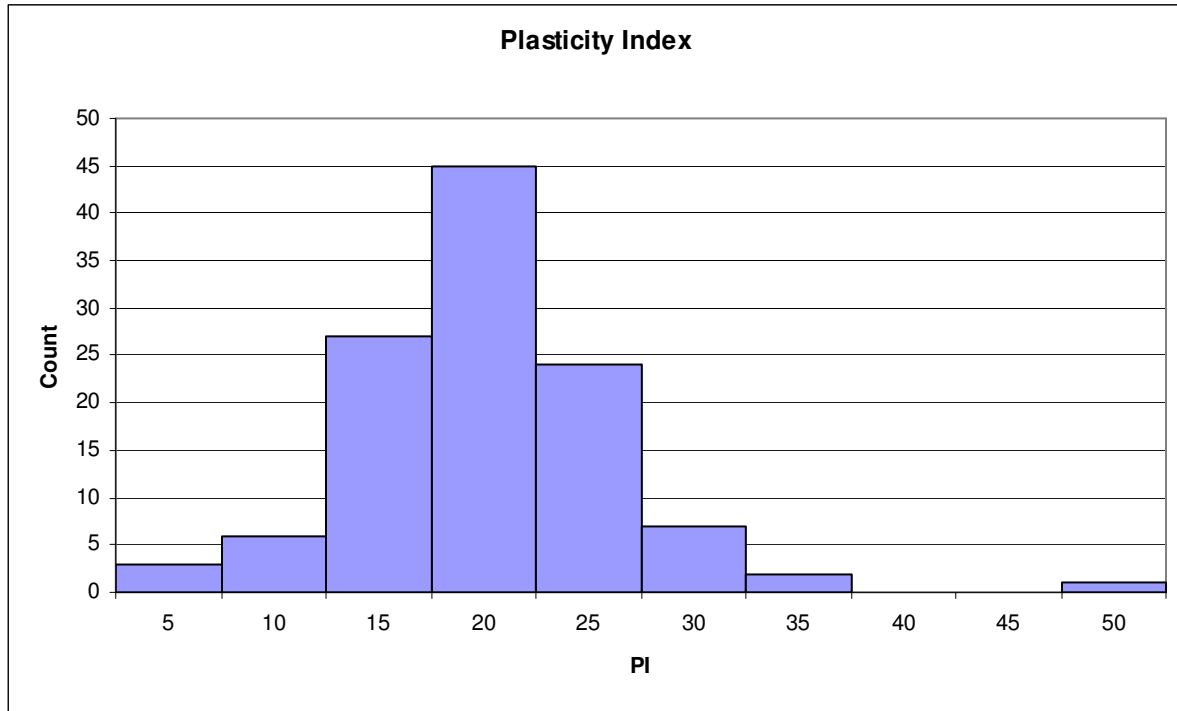


Figure 5: Histogram for Phase 2 WPIC Embankment Fill – Plasticity Index

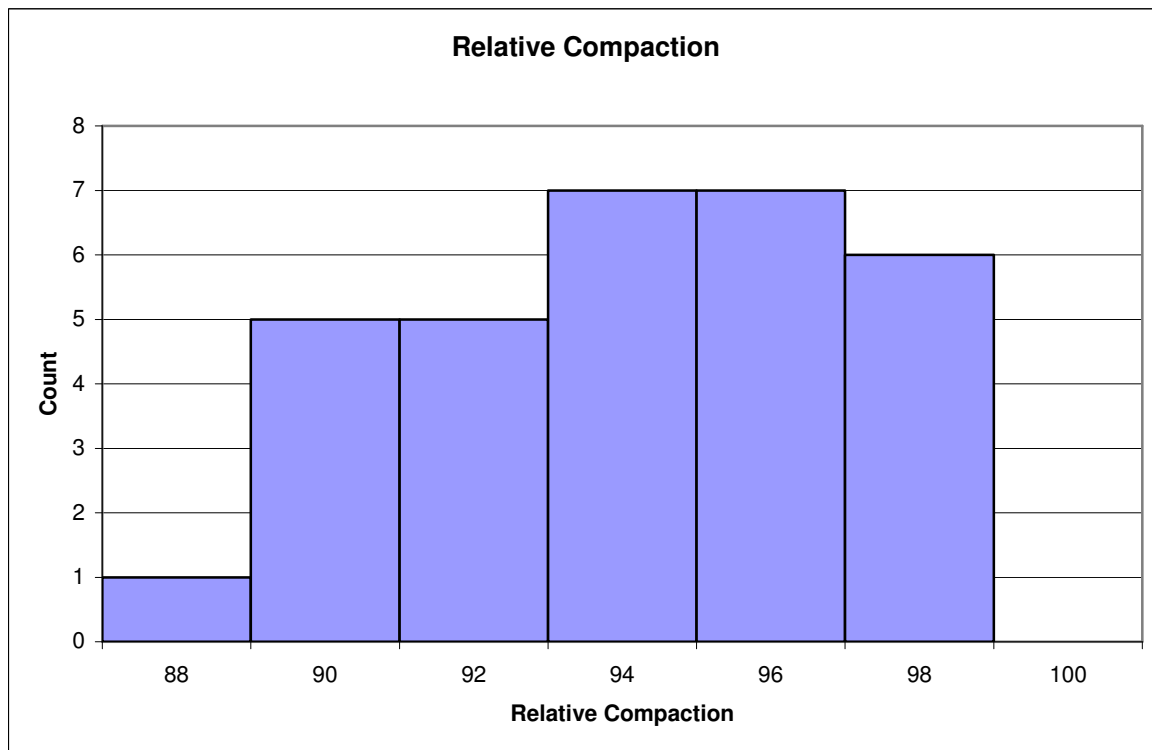


Figure 6: Histogram for Phase 2 WPIC Embankment Fill – Relative Compaction

Phase 2 Embankment Fill

These data include data from Bear River, Olivehurst Detention Basin, Pump Station, and Ring Levee Embankment Fill. The statistical data are summarized for Percent Fines, Liquid Limit, Plasticity Index, and Relative Density in the form of minimum, maximum, mean, and standard deviation in the Tables 7 through 10 below. Distribution of the data is presented in Figures 7 through 10.

Table 7 – Percent Fines QA Data Summary for Phase 2 Embankment Fill

% Fines – PHASE 2 EMBANKMENT FILL	
Value	QA
Number of Samples	68
Minimum	32.9
Maximum	91.7
Mean	66.5
Standard Deviation	10.0
No. Failing Tests	0

Table 8 – Liquid Limit QA Data Summary for Phase 2 Embankment Fill

LL – PHASE 2 EMBANKMENT FILL	
Value	QA
Number of Samples	69
Minimum	24
Maximum	60
Mean	37
Standard Deviation	6.5
No. Failing Tests	2

Table 9 – Plasticity Index QA Data Summary for Phase 2 Embankment Fill

PI – PHASE 2 EMBANKMENT FILL	
Value	QA
Number of Samples	69
Minimum	8
Maximum	35
Mean	17.3
Standard Deviation	5.1
No. Failing Tests	6

Table 10 – Relative Compaction QA Data Summary for Phase 2 Embankment Fill

Relative Compaction – PHASE 2 EMBANKMENT FILL	
Value	QA
Number of Samples	61
Minimum	90
Maximum	99
Mean	94.1
Standard Deviation	2.8
No. Failing Tests	0

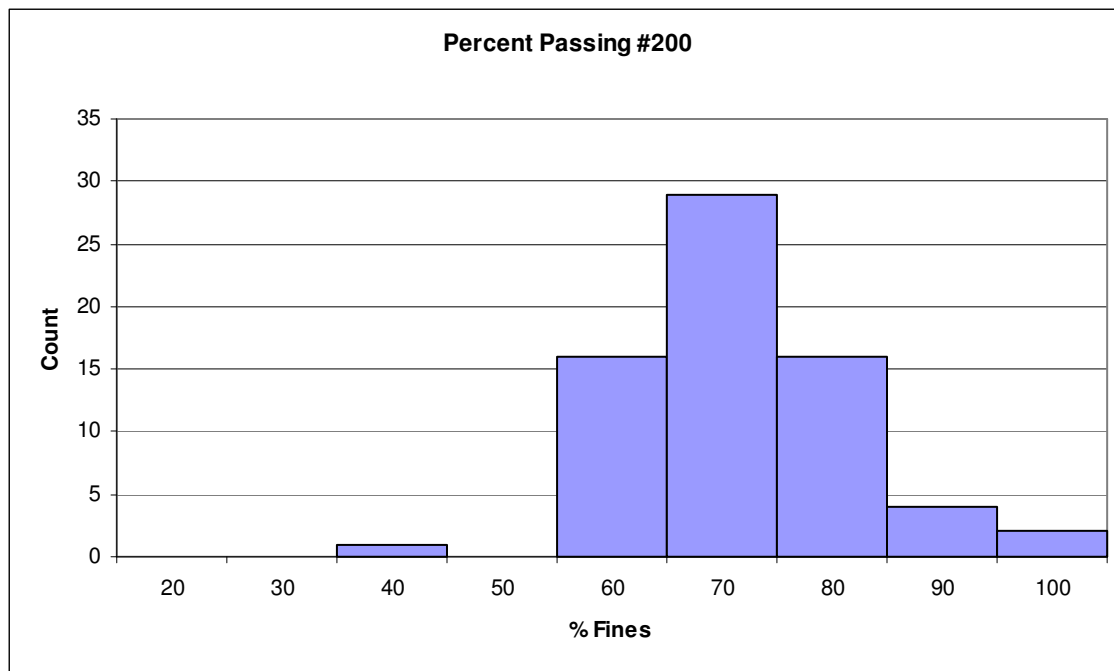


Figure 7: Histogram for Phase 2 Embankment Fill – Percent Fines

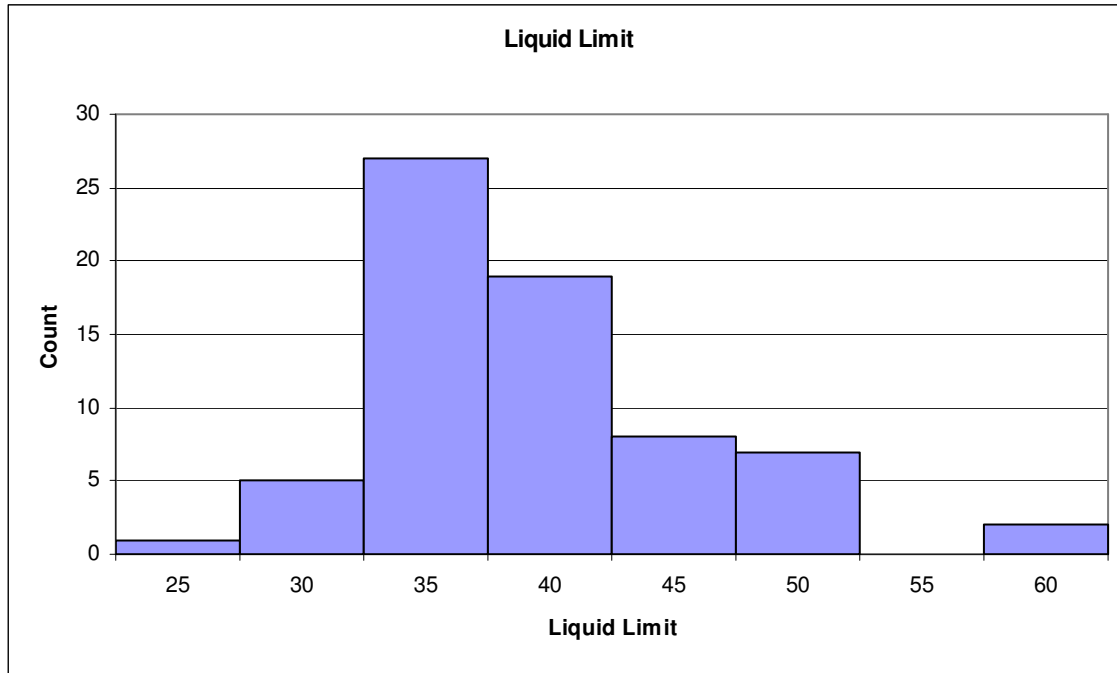


Figure 8: Histogram for Phase 2 Embankment Fill – Liquid Limit

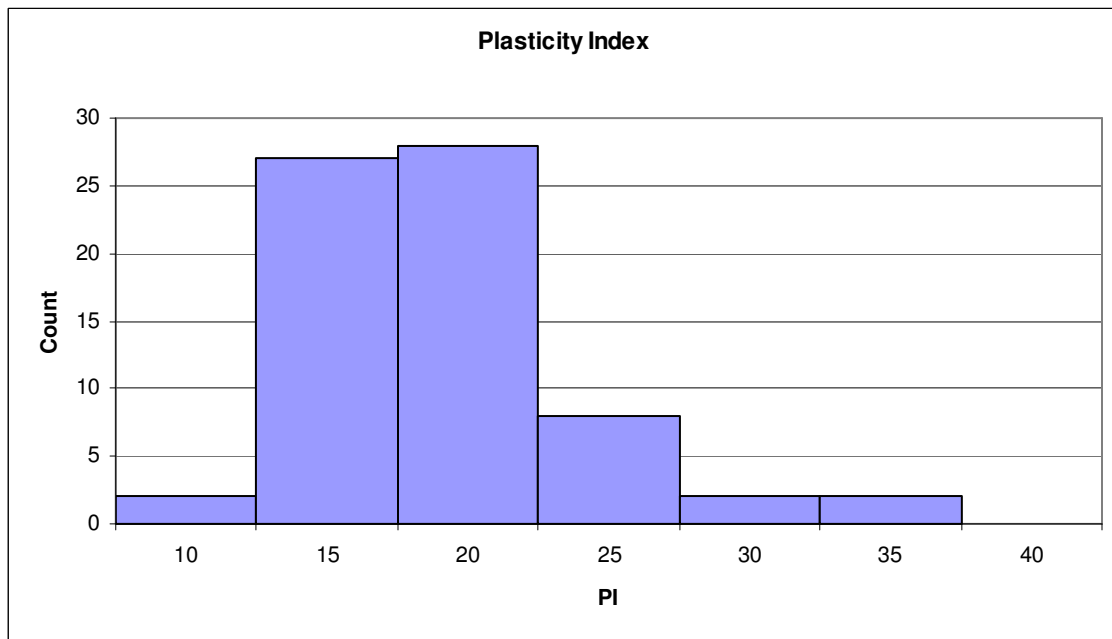


Figure 9: Histogram for Phase 2 Embankment Fill – Plasticity Index

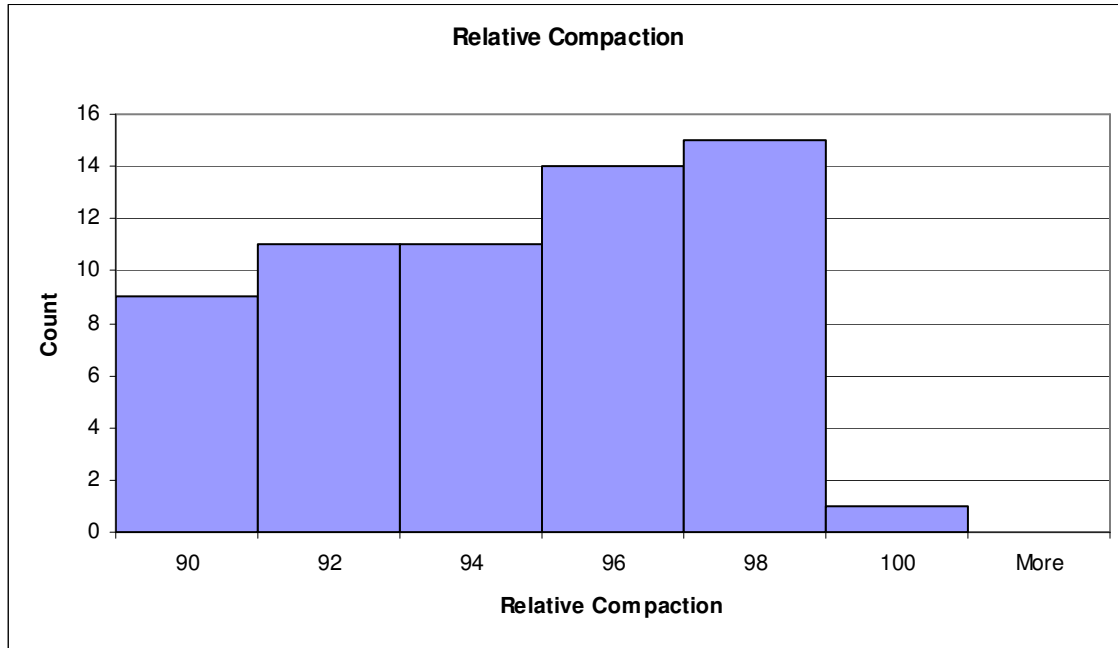


Figure 10: Histogram for Phase 2 Embankment Fill – Relative Compaction

Phase 4 Embankment Fill

Phase 4 Embankment Fill data include the data from the impervious fill. The statistical data are summarized for Percent Fines, Liquid Limit, Plasticity Index, and Relative Density in the form of minimum, maximum, mean, and standard deviation in the Tables 11 through 14 below. Distribution of the data is presented in Figures 11 through 14. Some of the data did not meet the specifications in terms of Atterberg Limits and consisted of non-plastic silty sand. However, during the field work it was allowed to be placed on the side slopes and considered adequate for that purpose.

Table 11 – Percent Fines QA Data Summary for Phase 4 Embankment Fill

% Fines – PHASE 4 EMBANKMENT FILL	
Value	QA
Number of Samples	62
Minimum	21.2
Maximum	82.8
Mean	61.4
Standard Deviation	17.2
No. Failing Tests	0

Table 12 – Liquid Limit QA Data Summary for Phase 4 Embankment Fill

LL – PHASE 4 EMBANKMENT FILL	
Value	QA
Number of Samples	62
Minimum	0
Maximum	44
Mean	26
Standard Deviation	13.9
No. Failing Tests	0

Table 13 – Plasticity Index QA Data Summary for Phase 4 Embankment Fill

PI – PHASE 4 EMBANKMENT FILL	
Value	QA
Number of Samples	62
Minimum	0
Maximum	27
Mean	11.9
Standard Deviation	7.1
No. Failing Tests	16

Table 14 – Relative Compaction QA Data Summary for Phase 4 Embankment Fill

Relative Compaction – PHASE 4 EMBANKMENT FILL	
Value	QA
Number of Samples	46
Minimum	87
Maximum	101
Mean	95.6
Standard Deviation	2.9
No. Failing Tests	1

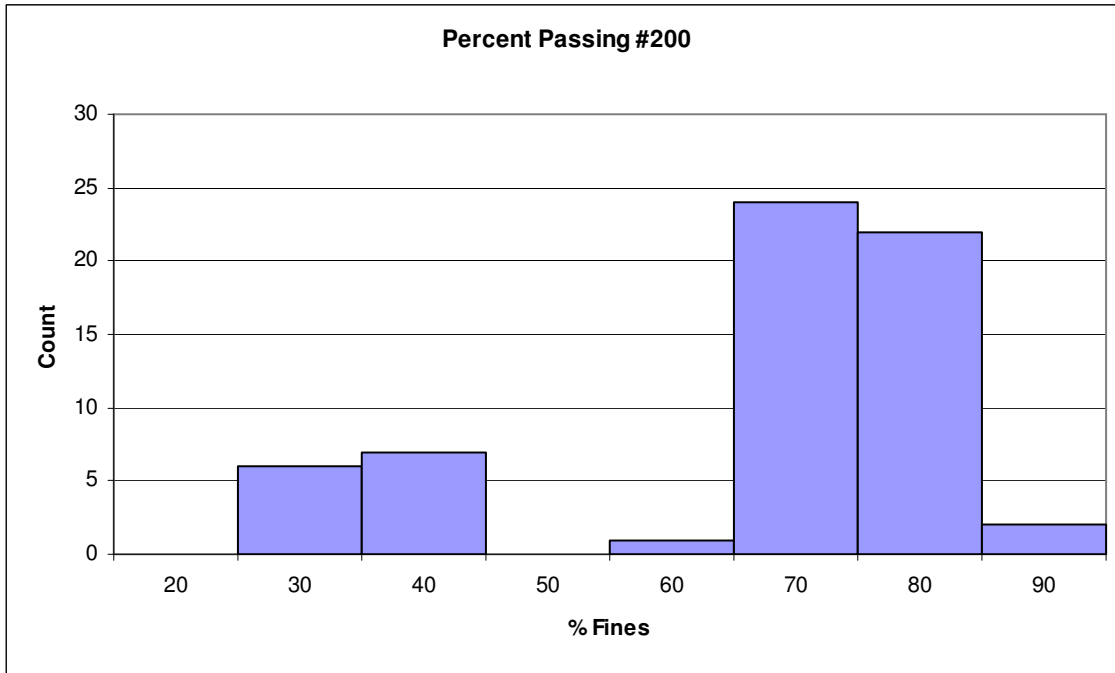


Figure 11: Histogram for Phase 4 Embankment Fill – % Fines

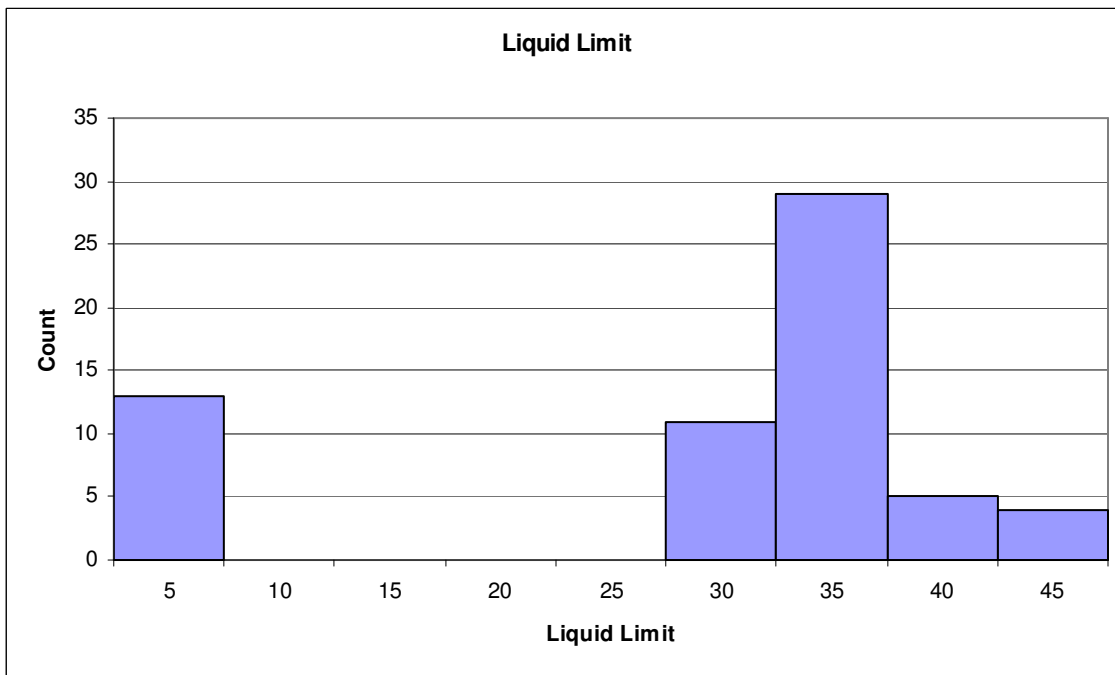


Figure 12: Histogram for Phase 4 Embankment Fill – Liquid Limit

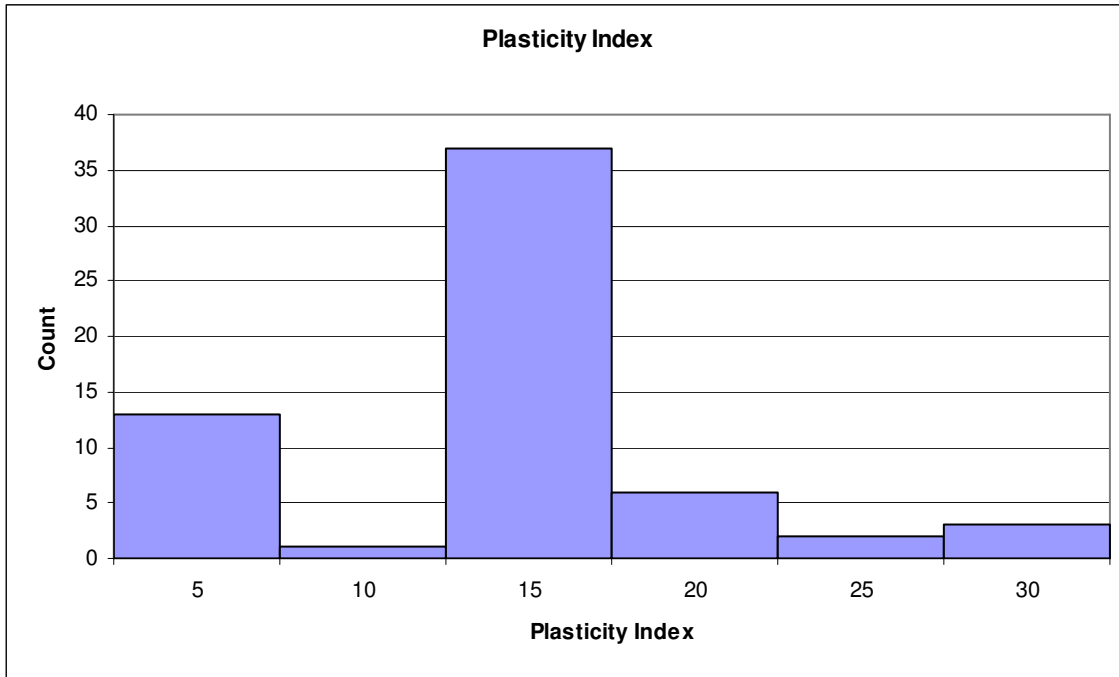


Figure 13: Histogram for Phase 4 Embankment Fill – Plasticity Index

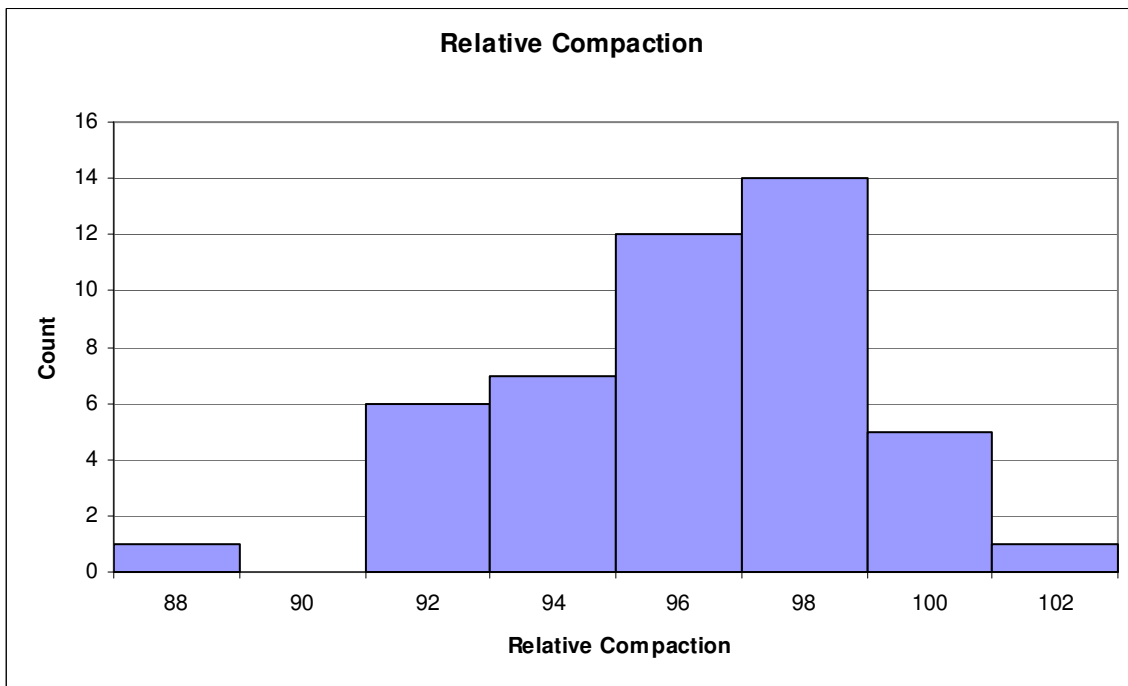


Figure 14: Histogram for Phase 4 Embankment Fill – Relative Compaction